Project Title:
A Search for Magnetic Field Signatures of Coronal Mass Ejections

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Project Information:
The objective of this proposed program is to develop observational techniques in vector magnetometry for the identification of signatures indicative of potential coronal mass ejections. To carry out this objective we will obtain observations of vector magnetic fields in solar active regions using the Marshall Space Flight Center .s Tower Vector Magnetograph (TVM) that has recently been upgraded with a new CCD camera and data system. The data from these observations will be used in two newly developed analysis techniques that measure the global nonpotentiality of bipolar active regions: (1) length of strong-field and strong-shear main neutral line and (2) global net current. X-ray coronal images from the Yohkoh satellite will be analyzed for the presence of sigmoidal structures in these regions, and flare lists will be examined to determine the production of CMEs from them. The SOHO/LASCO lists of observed CMEs will also be used to locate the regions producing the CMEs. Subsequently, analyses will be carried out to determine the degree of correlation between the production of CMEs and the two new magnetic signatures as well as the sigmoidal signature. An initial study of four active regions has shown that each of these two new magnetic parameters is a useful indicator of an active region's likely CME productivity. It was also shown that these two parameters may be more reliable predictors than is the presence or absence of sigmoidal structure in coronal X-ray images. This latter result would be particularly useful since the morphological characterization of a sigmoidal signature is fairly qualitative in nature while the two parameters we propose are quantitative measures. Thus we are directly addressing the "Living With a Star" objective of finding reliable predictors of CME activity.

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